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USSR Report

ELECTRONICS AND ELECTRICAL ENGINEERING

No. 62

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USSR REPORT

ELECTRONICS AND ELECTRICAL ENGINEERING

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Antennas

USSR UDC 621.396.677

SYNTHESIS OF LINEAR ANTENNA ARRAYS USING A PREASSIGNED AMPLITUDE DIAGRAM

Gor'kiy IZV. VUZ: RADIOFIZIKA in Russian No 12, 1979 pp 1498-1504 manuscript received 11 Jan 79

SAVENKO, P. A., Computer Center, Institute of Applied Problems of Mechanics and Mathematics, Ukrainian Academy of Sciences

[Abstract] The results of analytic and numerical studies of the problem of synthesis of a linear equidistant antenna array are presented. Only the amplitude diagram is considered preassigned; no requirements are placed on the phase diagram. No limitations are placed on the distance between radiators. An equation is derived which can be used to synthesize both equidistant and nonequidistant arrays. The author thanks B. Z. Katsenelenbaum and N. N. Boytovich for continuous interest in the work and for stimulating discussion. Figures 3; references 8 Russian.
[128-6508]

USSR UDC 621.396.77

PHASOMETRIC MEASUREMENT OF RADIATION PATTERNS OF LINEAR ANTENNA ARRAYS

Gor'kiy IZV. VUZ: RADIOFIZIKA in Russian No 12, 1979 pp 1505-1513 manuscript received 11 Jun 79

ANTONOV, V. A., VEKSLER, N. V., IVKO, YU. V., KOROTKOV, V. S., SEMENOVA, L. R., TURCHIN, V. I., FOGEL', A. L. and FORTUS, I. M., Scientific Research Institute of Radiophysics

[Abstract] Two models of antenna arrays were studied. Each consisted of uniformly spaced half-wave dipoles with a common reflector, forming a multiple-lobe "blade" radiation pattern in space. Both antennas were placed horizontally on supporting and rotating devices which turned them relative to the vertical axis. The antennas received signals broadcast by a half-wave dipole with a reflector on a 20-meter tower. A reference signal for comparison was transmitted by cable. Amplitude cross sections of the full multiple-lobe radiation pattern are presented. In spite of differences in the fine structure of side-lobe radiation measured by various methods, there is rather good agreement between the total levels of side-lobe radiation and width of the main maximum, which allows the phasometric method of measurement to be used for many practical purposes. Figures 14; references 8 Russian.
[128-6508]

USSR UDC 62-501.1

A FREQUENCY-INDEPENDENT PSEUDOLINEAR CORRECTING DEVICE

Leningrad IZV. VUZ: PRIBOROSTROYENIYE in Russian No 10, Oct 79 pp 28-32
manuscript received 6 Apr 78

KULICHENKO, A. G., KULICHENKO, T. A., MIKHALEV, A. S. and SULYAYEV, A. S., Far-Eastern Polytechnical Institute imeni V. V. Kuybyshev

[Abstract] An algorithm is constructed for design of a pseudolinear correcting device whose characteristics are independent of frequency. One possible structural realization is diagrammed and the specifics of utilization of the device suggested are analyzed on the example of adjustment of tracking systems. The device allows very simple and effective adjustment of the phase-frequency characteristic of automatic control systems. Its area of application is limited by the possibility of development of forced movements in the systems to which it is applied, because forced movements cause hunting. The paper was recommended by the Department (Kafedra) of Computing Techniques. Figures 6; references 3 Russian.
[134-6508]

USSR UDC 65.012.45:681.3.087.92:681.786.3

A COMPLEX OF ELECTRONIC APPARATUS FOR AUTOMATION OF MEASUREMENTS, COLLECTION AND PROCESSING OF INFORMATION

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 1, Jan 80 pp 23-25

YEVDOKIMOV, M. A., ZHARKOV, A. P., NIKITIN, A. M., POPOV, A. A., SINITSYN, N. V. and SMIRNOV, N. N.

[Abstract] A description is presented of a small, highly accurate analog-digital complex (ATsK) designed for automation of the process of measurement and processing of the results of various physical experiments. The ATsK can perform continuous or periodic measurements and record amplitude values and phase differences of sine-wave or pulsed signals which depend on the angular or linear position of the object being studied. The ATsK allows the information produced during experiments either to be input directly to the computer or stored for subsequent computer processing. Structural diagrams of the device are presented. Figures 3; references 1 Russian.
[135-6508]

USSR UDC 681.3

THE PROBLEM OF METHODS OF INCREASING THE SPEED OF ANALOG INFORMATION CONVERTERS

Leningrad IZV. VUZ: PRIBOROSTROYENIYE in Russian No 10, Oct 79 pp 50-54 manuscript received 1 Aug 78

KOVALEV, A. M. and PUCHKOV, YU. I., Smolensk Branch, Moscow Institute of Power Engineering

[Abstract] The speed of compensation-type analog computers and measuring devices can be increased by introducing an additional high-speed channel to their structure. This article analyzes various methods of introduction of such a channel when additive and multiplicative components are present in the error of the initial system and the correcting channel. The influence of the multiplicative and additive components of error of the compensations system and correcting channel on the static and dynamic properties of the structures is studied. The paper was recommended by the Department (Kafedra) of Automatics and Telemechanics. Figures 3; references 5 Russian.
[134-6508]

USSR UDC 681.325

SHIFT-REGISTER-BASED COUNTERS FOR ARBITRARY NUMBER SYSTEMS

Moscow IZV. VUZ: ELEKTROMEKHANIKA in Russian No 12, Dec 79 pp 1132-1134 manuscript received 14 Apr 77; after completion 6 Dec 78

KOROBKOV, R. V. and SEMERNIKOV, YE. A.

[Abstract] The purpose of this work is to develop a method of synthesis of counters based on shift registers with feedback with no limitations on the interal structure of the logic device in the feedback circuit, and to estimate the efficiency of the counters. A structural diagram of a counter is presented. A logic system is required which can input to the register information on the k different states of the register. After k signals have been counted, the register returns to its initial state. The method of synthesis of a k-nary counter of this type is reduced to the following steps: 1) writing all 2^k possible feedback functions; 2) discarding functions which do not satisfy the requirements of the process; 3) forming groups of similar functions from those remaining and selecting the best one from each group; 4) finding the minimum form of the function selected; 5) synthesis of a logic circuit to realize the shortest minimum form; 6) synthesis of the modulo k counter. An example is presented. Figures 2; tables 4; references 1 Russian.
[121-6508]

USSR UDC 621.317.3

ERROR IN DETERMINATION OF THE DYNAMIC CHARACTERISTICS OF LINEAR SYSTEMS WITH PULSED EXCITATION

Leningrad IZV. VUZ: PRIBOROSTROYENIYE in Russian No 10, Oct 79 pp 32-37 manuscript received 22 Jan 79

TIMOFEYEV, V. M., Leningrad

[Abstract] A universal circuit is shown which can be used as a correcting circuit for video pulses of practically any shape. The circuit consists of a voltage divider, one side being purely resistive, the other side consisting of a resistor plus an LRC circuit in series. Requirements for calculation of the characteristics of the individual elements of the circuit are outlined. Figures 3; references 3 Russian.
[134-6508]

USSR UDC 621.385.832.56:621.397.132

THE NEW LI457 AND LI458 VIDICONS FOR COLOR TELEVISION

Moscow TEKHNIKA KINO I TELEVIDENIYA in Russian No 1, Jan 80 pp 7-12

BELOUSOVA, V. S., KALANTAROV, M. A., KOZLOV, V. A., LAPUK, A. G., MIKAYLOV-TEPLOV, N. N., SUBBOTINA, G. N., TRIFONOV, V. P. and YUDOVINA, G. A.

[Abstract] Characteristics of the new LI457 and LI458 vidicons are described. These devices use an "anticomet" projector, which additionally scans sections of the target which are too brightly illuminated during the reverse beam scan, thus reducing the "comet-tail" distortion seen when an image which is too brightly illuminated moves across the TV screen. An antihalo disk is used in each vidicon, and the LI458 also has an infrared radiation cutoff filter to reduce sensitivity to radiation with wavelength over 750 nanometer. The devices can be used at target temperatures from -30 to +50 C. They are resistant to vibrations up to 200 Hz with accelerations of 5 g, and can withstand repeated shock loadings with accelerations of 15 g. The guaranteed operating life is 750 hours. Figures 12; tables 2; references 6 Western.
[122-6508]

USSR UDC 621.395.63

OPERATION OF CHARGE-COUPLED DEVICES IN THE PULSED EXPOSURE MODE

Leningrad IZV. VUZ: PRIBOROSTROYENIYE in Russian No 10, Oct 79 pp 61-64 manuscript received 6 Dec 78

GRYAZIN, G. N., Leningrad Institute of Precision Mechanics and Optics

[Abstract] The use of charge-coupled devices as "light-to-light signal" converters in flash-exposed TV cameras represents a new step in the development of television engineering. This article explains the specifics of the operation of CCD in pulsed television systems, considering the unsteady operating mode of the charge accumulators. Equations are derived for the phase-frequency characteristic, accumulation characteristic, potential across the capacitance at the end of exposure and charge resistance. The accumulation characteristics and phase-frequency characteristic are also diagrammed. The paper was recommended by the Department (Kafedra) of Optoelectronic Devices. Figures 2; references 4 Russian.
[134-6508]

USSR UDC 621.397.13

METHOD OF COMPENSATION OF NOISE DURING RECEPTION OF TV SIGNALS ON SPACED ANTENNAS

Moscow ELEKTROSVYAZ' No 1, 80 pp 47-52 manuscript received 29 May 79

NIKONOV, G. I.

[Abstract] As the result of multiple reflections from high buildings, a signal which is regarded in time appears in the receiving antenna in addition to the basic signal. The presence of this lagging signal is manifested in the well known distortions on the television screen. The present paper proposes a method for compensation of the reflected signals using special antennas and given recommendations with respect to its realization. It should be noted that it is possible to assure effective operation of a system of compensation of the noise of reflected signs, as follows from the material of the paper, only with proper fulfillment of it and accurate adjustment.
[129-6415]

USSR UDC 771.428.778.588.534.2

A THREE-INCH SUPERORTHICON WITH INCREASED TARGET SIZE

Moscow TEKHNIKA KINO I TELEVIDENIYA in Russian No 1, Jan 80 pp 12-15

GALINSKIY, N. D., KUZNETSOVA, A. V., MATVEYEVA, A. G., SHEVELEVA, V. V. and YUDZON, O. I.

[Abstract] Methods are discussed for improving the two primary quality indices of superorthicon tubes; resolution and signal/noise ratio. A description is presented of a three-inch superorthicon with enlarged target. Visual evaluation of the image transmitted by the tube indicates that it is comparable in quality to the image produced in a camera with an 89 millimeter superorthicon. The operating mode of the new tube, the LI239, is standard. The advantages of the new tube include the ability to operate at various light conditions, decreased microphone effect and increased signal/noise ratio. Figure 1; tables 1; references 5 Russian.
[122-6508]

USSR UDC 771.531.351.5:778.6]:621.397.13

TSO-T-90LM COLOR REVERSAL FILM FOR TELEVISION

Moscow TEKHNIKA KINO I TELEVIDENIYA in Russian No 1, Jan 80 pp 31-32

GNIDASH, V. V., GRECHKO, L. V., SVIRIDENKO, A. I. and SVIRIDENKO, M. N., Shostkinskiy Affiliate of the State of Scientific-Research Institute for Photographic Chemistry

[Abstract] In 1977 the Shostkinskiy Affiliate of the State Scientific-Research Institute for Photographic Chemistry developed the TSO-T-90LM color reversal film for television. The film is intended for television reporting using 3200 K light sources. It is distinguished by improved color fidelity, finer grain and a tougher emulsion, allowing high-speed development at 30 C. The new film is particularly superior to its predecessor in color fidelity in the red region of the spectrum. It is now being series produced at "Sveta" Plant. The quality of the first production run is equal to that of the experimental batch, but manufacture of the film is quite difficult, because the tolerance for change in the color balance index is not 0.6 as indicated in the technical conditions, but rather 0.2. It will be necessary to analyze statistical materials, largely supplied by consumers, in order to determine the proper value. Figures 2; tables 1; references 2 Russian.
[122-6508]

USSR UDC 778.534.48

PROGRAMMED APPARATUS FOR ADDITION OF SOUND TO MOTION PICTURE AND TELEVISION FILMS

Moscow TEKHNIKA KINO I TELEVIDENIYA in Russian No 1, Jan 80 pp 56-61

KLIMENKO, G. K.

[Abstract] The film time code developed at the Institute of Radiotechnology in Munich and tested on West German television has shown that the new technique can be used not only for preparation of news programs, but also documentaries and popular programs. The new technique can save up to 50 percent of the time spent in the operations of searching for and synchronous matching of films to be broadcast. The high level of standardization of motion picture equipment and techniques in comparison with video tape recording equipment and techniques makes it cheaper and less expensive to add sound to motion picture film to be broadcast on television, even if the original event was recorded on video tape. In the most advanced technique, the film is shot in standard motion picture cameras, then edited into alternating scenes in rolls A and B. The sound is then generated and recorded on video tape. Finally, the film is projected in a dual film chain to add the video to the video tape. By allowing a 10 or 20 frame overlap at each end of each scene on the alternating reels, full advantage can be taken of the capacity of the video equipment for wipes, dissolves, color correction, etc. Some equipment used in the USSR for this type of work is described, and photographs are presented of a motion picture projector and a triple-drive magnetic tape recorder. Figures 4; references 5 Western.
[122-6508]

USSR UDC 522.983.1

ESTIMATE OF THE ACCURACY OF POINTING OF A TELESCOPE IN AN AZIMUTHAL MOUNT

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 1, Jan 80 pp 14-15

SHITOV, V. G.

[Abstract] In addition to the popular equatorial mounting, many telescopes, particularly large optical and radio telescopes, are carried in azimuthal mountings, consisting of two mutually perpendicular axes, one vertical. Azimuthal mounting greatly complicates the telescope movement automatic control system, requiring that some means be used to convert the coordinates from equatorial to azimuthal. The three main components of error which can arise in guiding such a telescope are analyzed: astronomical errors; instrumental errors; and automated control systems (SAU) errors. Graphs of the sensitivity functions involved are presented. The deflection of the optical axis of the telescope caused by the errors inherent in an azimuthal mount is calculated. The inherent difficulty of guiding a telescope with this type of mounting requires that more rigid requirements be placed on the dynamic accuracy of the mounting for tracking near the zenith. The results of the calculations performed were used in planning the large gamma telescope at the Crimean Astrophysical Observatory, USSR Academy of Sciences. Figures 3; references 4 Russian.
[135-6508]

Communications, Communications Equipment; Networks; Data Transmission and Processing

USSR

NEW STAGE IN PLANNING THE DEVELOPMENT OF ELECTROCOMMUNICATIONS IN THE USSR

Moscow ELEKTROSVYAZ' No 1, Jan 80 pp 1-5

SAMSHIN, V. A.

[Abstract] A new stage in planning the development of electrocommunications in the USSR and a long list of present and future items concerned with Soviet work in this field are discussed. The high rate of development in the USSR of the means of electrocommunication and radio broadcasting and television networks has been caused by a number of factors which produced a requirement for the transmission of enormous floods of information. For a number of years the rate of growth of the means of communication has by far lead the average rate of other sectors of the economy. In spite of this it is possible as yet only partially to assure transmission of the sharply increasing volume of information. Naturally, in long-term plans a still higher rate of growth of communication is provided for. However, today the volume of production of communication equipment and cables is the principal limiting factor. [129-6415]

USSR UDC 621.391 + 519.872(031)

SOME PROBLEMS OF CONTROL OF A TELEPHONE NETWORK

Moscow ELEKTROSVYAZ' No 1, Jan 80 pp 21-24 manuscript received 5 Apr 78

SNEPS, M. A.

[Abstract] The paper presents a general approach to the solution of the problem of control of a telephone network as a whole, including calculation of the carrying capacity of switching equipment and control devices. Repeated attempts of subscribers to establish a connection are taken into account. Consideration is given to the norm setting for losses and reliability indicators issuing from economic calculations. The following points are discussed: 1) Approximate method of network calculations; 2) Analysis of transmitting capacity: 3) Ratio of "expenditure-income" for the networks; 4) Basis of norms for losses; and 5) Control of the network. The presence is identified of a maximum on the load curve of a called subscriber which it is proposed to use during choice of tariffs, on the basis of norms of the quality of servicing and operating control during overloads on the long-distance networks. Figures 7; tables 1; references 7: 6 Russian, 1 Western. [129-6415]

USSR UDC 621.391.7

DATA TRANSMISSION BY A TELEPHONE EXCHANCE NETWORK

Moscow ELEKTROSVYAZ' No 1, Jan 80 pp 25-27 manuscript received 29 Jun 79

SHVARTSMAN, V. O. and OSIPOV, V. G.

[Abstract] The employment in the USSR and abroad of a general use telephone exchange network (TF-OP) for data transmission is considered. The principal problems and the prospects for such data transmission are examined, and in particular the absence of harmful effect of data transmission on the operation of TF-OP networks is substantiated. It is concluded that the most effective direction for the growth of data transmission technology is the creation of specialized data transmission networks in conjunction with the use for data transmission of a TF-OP network with the limitations resulting from its specific properties taken into account. References 5: 4 Russian, 1 Western.
[129-6415]

USSR UDC 621.394.62 (088.8)

SIGNALS AND CODES OF DIGITAL TRANSMITTING SYSTEMS

Moscow ELEKTROSVYAZ' No 1, Jan 80 pp 33-37 manuscript received 3 Jun 79

POROKHOV, O. N.

[Abstract] Problems concerned with the signals and codes of digital transmitting systems are analyzed on the basis of the recommendations of general communications theory. The following items are considered: 1) Special features of methods for transmission of digital information; 2) Signals of digital transmissions systems (potential noise, immunity of a digital signal; coefficient of relative noise immunity; minimum upper frequency of signal spectrum; probability of change of modulated parameter P_T; coefficient of stability of the signs of the clock frequency); and 3) Codes of digital transmission systems (alphabetical and nonalphabetical). Figures 2; tables 4; references 17: 6 Russian, 11 Western.
[129-6415]

USSR UDC 621.395.5:621.372.544

DIGITAL CONJUGATION DEVICES (TRANSMULTIPLEXERS) IN COMMUNICATION SYSTEMS

Moscow ELEKTROSVYAZ' No 1, Jan 80 pp 28-32 manuscript received 13 Sep 79

GOL'DENBERG, L. M., MATYUSHKIN, B. D. and POLYAK, M. N.

[Abstract] This paper is the first part of work devoted to a discussion of the theory and the principles of construction of transmultiplexers [conjunction devices for communication systems] based on contemporary components, which also have a significant value in other fields of communication technology, e.g., during construction of digital modulators--demodulators, converters of pulse code modulation signals, etc. The following items are discussed in the present paper: 1) Functions of transmultiplexers (TM); 2) Principal types of operations in TM; 3) Separation of channel signal from group signal with simultaneous transfer of the spectrum of the separated signal into the low-frequency regions; 4) Inversion of the spectrum of a signal located in a low-frequency region; 5) Interpretation of signals by digital filter; and 6) Shaping of a signal with single-sideband with a subsequent transfer of spectrum. In the forthcoming second part of the paper, circuits of transmultiplexers will be considered and a comparative analysis made of them. Figures 11; references 13: 7 Russian, 6 Western.
[129-6415]

USSR UDC 621.395.74.001.2

QUALITY OF SERVICE OF AUTOMATIC LONG-DISTANCE TELEPHONE SERVICE

Moscow ELEKTROSVYAZ' No 1, 80 pp 62-64 manuscript received 14 Mar 78

KLIBANER, A. B. and PEVTSOV, N. V.

[Abstract] The paper discusses the following factors which affect the quality of automatic long-distance telephone service (AMTS): oscillations of the long-distance load, standardization of losses and organization of the monitoring of the service quality on AMTS. The authors recommend that: 1) A calculation of the quantity of AMTS equipment be made according to the calculated magnitude of the long-distance load; 2) The norm of losses at switching sections of the long-distance network be determined with losses in the AMTS taken into account; and 3) Measurements of the parameters of teletraffic and monitoring of the service quality systematically be performed in order to lead to nonconformity of the peak-load hour (ChNN) on various routes. Tables 2; references 5 Russian.
[129-6145]

USSR UDC 621.396.621.324

SENSITIVITY OF A PHOTORECEPTOR WITH HETERODYNING OF THE SIGNAL IN A PHOTOMULTIPLIER

Gor'kiy IZV. VUZ: RADIOFIZIKA in Russian No 12, 1979 pp 1467-1471 manuscript received 23 Jun 78

SAVENKO, A. A. and KIZHNEROVA, V. N., Gomel'skiy State University

[Abstract] The heterodyning principle can be used in optical communication channels for the reception of amplitude-modulated light, just as it is now used in radio frequency receivers. A radio-frequency oscillator is used to produce the IF signal which modulates the photocurrent in the photomultiplier. A difference-frequency signal is thus produced. Sensitivity and nonlinear distortion are improved by this method of reception. Figures 1; tables 1; references 5 Russian.
[128-6508]

USSR UDC 621.397.8

INCREASE OF THE EFFECTIVENESS OF USE OF FREQUENCY CHANNELS IN THE TRANSMITTING NETWORK FOR TV BROADCASTING

Moscow ELEKTROSVYAZ' No 1, Jan 80 pp 38-41 manuscript received 16 Feb 79

LOKSHIN, M. G.

[Abstract] In view of the fact that it will be possible in the immediate future to create conditions for expansion of the zone of multiprogram broadcasting, a major problem today is an increase of the effectiveness of use of frequency channels. The principal work directed to this end includes: 1) A decrease of the standards on the protective ratio (i.e., the minimum ratio of the level of the effective signal to the level of the interference, during which reception of a signal with the required quality is assured); 2) Use of receiving antennas for collective and individual use of the II and III category of complexity (among them antennas for reception of signals with vertical polarization); 3) An increase of the noise immunity and sensitivity of TV receivers; 4) Use of orthogonal polarization of signals of mutually interfering transmitter; 5) An increase of the number of the power ratings of typical TV transmitter; 6) Wide use during construction and modernization of TV stations of higher antenna masts; and 7) A decrease of the radiated power of the sound signals. Simultaneously, it is necessary to conduct a

series of investigations with respect to the above problems with the object of accumulating statistical information and the development of new proposals with respect to a further increase of the efficiency of frequency planning, also turning attention during this to promising frequency bands, in particular to the 12 Gigahertz band. Figures 3; references 13 Russian.
[129-6415]

USSR UDC 621.397.61

SYSTEM OF CENTRALIZED AUTOMATIC MONITORING AND CONTROL OF RADIO-TELEVISION TRANSMITTING STATIONS

Moscow ELEKTROSVYAZ' No 1, Jan 80 pp 42-47 manuscript received 29 Jun 79

KHAZANOV, A. SH., SHISHLO, V. N., SHCHERBICH, A. V., KORABCHIKOV, V. D., PASHKOVSKIY, I. YU. and SOLNECHNAYA, YE. V.

[Abstract] The principles of construction and a block diagram of a system for monitoring and control of multiprogram radio-television transmitting stations are presented. In accordance with these principles, the system was developed and put into operation at the Minsk Radio-Television Transmitting Station (RTPTs) for four television broadcast transmitters and five radio broadcast transmitters. Figures 4; references 11 Russian.
[129-6415]

USSR UDC 621.316.722.011.4

PULSE-AMPLITUDE MODULATION OF VOLTAGES WITH OSCILLATING CHARGE OF CONDENSORS

Moscow IZV. VUZ: ELEKTROMEKHANIKA in Russian No 12, Dec 79 pp 1088-1092
manuscript received 5 Apr 77; after completion 16 Dec 77

KOFMAN, DAVYD BORISOVICH, candidate in technical sciences, Dotsent Moscow Aviation Institute; and ZHURYAVLEV, GRIGORIY GRIGOR'YEVICH, graduate student, Moscow Aviation Institute

[Abstract] A simple charging device with pulse-amplitude modulation (PAM) of the voltage, capable of charging a condensor in the mode of maximum efficiency or in the mode of steady power consumption is analyzed. The device consists of a current invertor and a PAM voltage generator. The operation of the circuit is analyzed for the case when the charging circuit is an oscillating RLC circuit. Figures 4; references 2 Russian.
[121-6508]

USSR UDC 512.5:535.41

A HIGH RESOLUTION SINE-COSINE SIGNAL INTERPOLATOR

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 1, Jan 80 pp 42-43

SVERDLICHENKO, V. D. and PRITSKER, V. I.

[Abstract] High resolution interpolators are usually based on the principle of trigonometric conversions using a resistive phase inverter. This article suggests a principle of design of an interpolator allowing a significantly higher resolving capacity, limited only by the drift of the circuit elements and the signal-to-noise ratio of the input signals. A functional diagram is presented of the device and its operation is analyzed. The high-order decade consists of a circular resistive phase inverter which receives four input voltages $u^1 = U_m \sin\phi$, $u^2 = U_m \cos\phi$, $u^3 = -u1$ and $u^4 = -u2$. The voltages from each resistor of the decade are then fed in series to the inputs of two operational amplifiers by means of two groups of switches. The switches of each group are closed simultaneously in pairs so that as each pair is closed, the operational amplifiers are connected to a corresponding resistor of the decade. The digit-by-digit principle of construction of the interpolator used in this device greatly increases its resolution, but it has a significant shortcoming. The sequential search for a point with zero potential in each decade decreases the speed of operation in proportion to the increase in resolution. Figures 3; references 1 Russian.
[135-6508]

USSR UDC 537.533:621.384.64

SLOW CYCLOTRON WAVES IN A WAVEGUIDE WITH RELATIVISTIC ELECTRON BEAM

Gor'kiy IZV. VUZ: RADIOFIZIKA in Russian No 12, 1979 pp 1523-1533 manuscript received 31 Jul 78

KORENEV, I. L., YUDIN, L. A. and MUSTAFIN, KH. KH.

[Abstract] Analytic methods are used to study the problem of propagation of waves of small amplitude in an electron beam without ions moving along the axis of a smooth waveguide in a longitudinal magnetic field. Primary attention is given to the dispersion characteristics and structure of the slow cyclotron waves intended for acceleration of the ions. The electron density is assumed uniform through the beam. This is an idealization which simplifies analysis without substantially changing the results. The authors thank E. L. Burshteyn, M. L. Levin and V. N. Kurdyumov for helpful discussions and remarks. Figures 4; references 7: 4 Russian, 3 Western. [128-6508]

USSR UDC 531.7.08:62-501:519

METHODS OF INCREASING THE ACCURACY OF VERNIER ANALOG-DIGITAL CONVERTER MOVEMENTS

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 1, Jan 80 pp 26-28

KONYUKHOV, N. YE. and KOCHKAREV, V. S.

[Abstract] A study is made of a general diagram of a Vernier coupling to be used in an analog-digital converter (ATsP) for detection and measurement of movement. Particular interest is turned to the use of the Vernier ATsP device in the pulsed mode. Equations are presented which allow analysis and synthesis of Vernier movement ATsP and determination of the optimal relationships of new design factors for the achievement of high metrologic qualities. The use of amplitude-logical, positional principles of recognition of discrete sectors in composite or minimized Verniers is found to be an effective method for achievement of high resolving capacity in conversion. Figures 2; references 2 Russian.
[135-6508]

USSR UDC 681.3.05+681.2+621.31

PREDICTION OF THE EFFECTIVENESS OF DEVELOPMENT OF ANALOG-DIGITAL CONVERTERS

Leningrad IZV. VUZ: PRIBOROSTROYENIYE in Russian No 10, Oct 79 pp 57-60 manuscript received 14 Mar 77

MOISEYEV, V. S., Leningrad Institute of Precision Mechanics and Optics

[Abstract] A multisystems criterion of effectiveness is introduced in order to predict the demand for various types of analog-digital converters. It is defined as the probability that a given converter at a given moment in time will be better suited for certain specific conditions of application than other converters and will consequently be selected by consumers. The equations and tables developed can be used to predict the fraction of the market for ADC's that any given type will command. They can also be used, therefore, to determine when new types of ADC's are needed. The paper was recommended by the Department (Kafedra) of Computing Techniques. Tables 3; references 1 Russian.
[134-6508]

USSR UDC 621.3.072.7:621.314

PRINCIPLES OF DESIGN AND CONSTRUCTION OF ANALOG PHASE-SHIFTING DEVICES

Moscow IZV. VUZ: ELEKTROMEKHANIKA in Russian No 12, Dec 79 pp 1055-1059

VOLGIN, LEONID IVANOVICH

[Abstract] A mathematical model of the process of formation of the phase shift in a controlled phase shifter is used to generate generalized structural diagrams of open analog synchronous controlled phase shifters. The various structures presented and principles developed are applicable also to devices which convert voltage to time intervals. Figures 9; references 7 Russian.
[121-6508]

USSR UDC 681.3.087.92:531.7.08:62-192

DIGITAL CONVERTERS OF MICROMOVEMENTS WITH INTERMEDIATE TRANSFORMATION TO PHASE SHIFT

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 1, Jan 80 pp 28-30

MATVEYEVSKIY, V. R.

[Abstract] Digital devices for conversion of microscopic movement with intermediate transformation to phase shift have linear control characteristics, high resolution, speed and reliability. The overall structure of such devices is determined by the following phases of transformation: movement-to-phase, phase-to-code and code-to-number. This article discusses the first of these three phases in more detail, inasmuch as it goes far toward determining the total error of conversion. Existing types of converters are classified in a number of ways, including the method of production of the phase shift of the modulated signal, electromechanical or electrical. A system of single-channel phase conversion is suggested which is distinguished by the simplicity of both its electromechanical and electronic parts. It can operate over a virtually unlimited range of frequencies of the infralow frequency modulating signal. Figures 1; references 6 Russian.
[135-6508]

USSR UDC 681.3.087.92:681.786.3

THEORETICAL PRINCIPLES OF THE DESIGN OF A SUPPORT SYSTEM AND ESTIMATION OF THE QUALITY OF AN ANALOG-2-DIGITAL ANGLE CONVERTER

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 1, Jan 80 pp 20-24

DOMRACHEV, V. G.

[Abstract] The construction of a system to convert angular movement to a digital code is a complex task. It involves development of basic theoretical statements, reflecting the most significant regularities in the process of digital conversion and principles of its optimization. This article analyzes these problems. The accuracy of digital conversion of angular values is determined both by methodological and by instrumental errors. The distribution density of probabilities of random dynamic error is studied. If the limitation of the maximum resolution is eliminated, by increasing it it is possible to produce a greater quantity of information at the output of the converter. This results in an increase in the length of the code which must be used, and therefore its use is possible only in certain situations. References 6 Russian.
[135-6508]

USSR UDC 681.7.786.3/.787:621.3.019.3

INTERFERENCE-TYPE CONVERTERS OF ANGULAR DISPLACEMENT WITH BINARY OPTICAL HETERODYNING

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 1, Jan 80 pp 25-26

ROZOV, B. S. and SHCHURENKOV, A. A.

[Abstract] The use of the acoustooptical method in practical interferometry allows the manufacture of devices with minimum content of combination harmonics in the spectrum of the measurement signal and practical measurement of linear speeds in the range of 10^{-6}-1 m/s, angular speeds of 1-10^{6} angular seconds per second with a time constant for processing of interrupted motion of about 0.1 ms and linear (angular) displacements of a few meters (degrees) with measurement scales in the quasi-static mode of 10^{-2} μm (10^{-2} angular seconds). The optical parts of devices for measurement of the parameters of angular displacement are diagrammed, including a laser, semitransparent cube, mirrors, moving reflectors mounted on the object being measured, the acoustooptical modulator connected to a generator which produces two high-frequency signals and a photoreceptor. The devices can be

used to measure the parameters of both angular and linear movements, with graphic information imaged from the optical-mechanical scanner, and also in precision spectrometric, seismic and graphometric devices. Figures 3; references 6: 4 Russian, 2 Western.
[135-6508]

USSR UDC 621.318.435.3

DYNAMIC PROPERTIES OF MAGNETIC VALVE DC POWER SUPPLIES

Moscow IZV. VUZ: ELEKTROMEKHANIKA in Russian No 12, Dec 79 pp 1117-1121

OBRUSNIK, VALENTIN PETROVICH, candidate in technical sciences, Director Scientific-Research Institute of Automatics and Electromechanics attached to Tomsk Institute of Automated Systems of Control and Radioelectronics; and SILKIN, ALEKSANDR DOROFEYEVICH, junior research worker, Scientific-Research Institute of Automatics and Electromechanics attached to Tomsk Institute of Automated Systems of Control and Radioelectronics

[Abstract] A general description of magnetic valve DC power supplies is presented, with typical schematic diagrams of one and three phase units presented. The dynamic properties of the devices and their subcomponents are analyzed. These devices are always dynamically stable in open regulation circuits, and also in closed circuits with 0-inertia feedback. If the feedback loop includes inertia, the system may become unstable under certain conditions. Figures 4; references 7 Russian.
[121-6508]

USSR UDC 621.371:538.311

VARIATION IN MOMENT OF THE DIPOLE MODEL OF THE EXTERNAL MAGNETIC FIELD OF ELECTRIC MACHINES AS A FUNCTION OF OPERATING MODE

Moscow IZV. VUZ: ELEKTROMEKHANIKA in Russian No 12, Dec 79 pp 1093-1097 manuscript received 26 Dec 77

APOLLONSKIY, STANISLAV MIKHAYLOVICH, candidate in technical sciences, Dotsent, Higher Naval Engineering Order of Lenin School imeni F. E. Dzerzhinskiy

[Abstract] The external magnetic field of an electric machine can be represented by the field of one or more magnetic dipoles. Studies are performed in generalized form in an orthogonal curved system of coordinates. The analytic relationship between the modulus of the dipole moment vector of the model and the voltage, current and frequency of the power supply are analyzed. Results of the calculation are presented in the form of curves which are compared with experimental curves produced within the same range of change of influencing factors. Figures 2; references 7 Russian.
[121-6508]

USSR UDC 534.222.2

EXCITATION OF A NONLINEAR SONIC WAVE BY QUASI-MONOCHROMATIC ALFVEN PUMPING

Gor'kiy IZV. VUZ: RADIOFIZIKA in Russian No 12, 1979 pp 1461-1466 manuscript received 17 Oct 78

GALKIN, V. M., KANYGINA, I. A. and FAYNSHTEYN, S. M., Gor'kiy Polytechnical Institute

[Abstract] Using the interraction of an Alfven wave with an oppositely directed sonic wave as an example, a differential equation is derived which describes the steady form of the nonlinear LF field. The limiting cases of the solutions of this equation are analyzed. The results produced in the work are applicable for the description of the generation of LF signals of various types when dispersion and attenuation of oscillations are small, and may be useful for the diagnosis of plasma systems on the basis of the nature of the oscillations excited, and also for interpretation of effects in the cosmic plasma such as excitation of zebra structures in the solar atmosphere. Figures 2; references 6 Russian.
[128-6508]

USSR UDC 535.31

FLUCTUATIONS IN PHASE, ANGLE OF ARRIVAL AND FREQUENCY CORRELATION OF A SPHERICAL WAVE IN A RANDOM HETEROGENEOUS MEDIUM

Gor'kiy IZV. VUZ: RADIOFIZIKA in Russian No 12, 1979 pp 1472-1479 manuscript received 26 Oct 78

KRUPNIK, A. B., MOLODTSOV, S. N. and SAICHEV, A. I., Gor'kiy State University

[Abstract] The statistics of the phase and angles of arrival, as well as frequency correlation of spherical light waves are found in the small-angle approximation of geometric optics. The influence of spherical divergence of rays on the statistical characteristics of the parameters studied is discussed. The fluctuations in angle of arrival of a wave at an observation point are analyzed. References 10 Russian.
[128-6508]

USSR UDC 538.573

FORMATION OF SPATIAL COHERENCE AND POLARIZATION PROPERTIES OF ELECTROMAGNETIC RADIATION IN MEDIA WITH SPATIAL DISPERSION

Gor'kiy IZV. VUZ: RADIOFIZIKA in Russian No 12, 1979 pp 1453-1460 manuscript received 4 Jul 78

LYAKHOV, G. A. and MAKAROV, V. A., Moscow State University

[Abstract] A study is made of the effects of transformation of the spatial coherence and the polarization properties of electromagnetic radiation in media with spatial dispersion. Primary attention is given to new effects such as an increase in the degree of polarization of radiation as it propagates through an optically active medium, and the increase in the radius of spatial coherence in the process of extinction diffraction upon Bragg scattering in a medium with strong spatial dispersion. As light propagates through optically active media, the degree of polarization increases. Bragg scattering of electromagnetic radiation in crystals is accompanied by an increase in the radius of spatial coherence regardless of ordinary diffraction effects. The degree of polarization of light also increases upon scattering on cholesteric liquid crystals with a fully polarized wave propagating at the Bragg angle. The authors thank S. A. Akhmanov for supporting the work and for valuable critical remarks; B. A. Grishanin, V. I. Zharikov and Yu. V. Ponomarov for helpful discussions. Figures 3; references 9: 8 Russian, 1 Western.
[128-6508]

USSR UDC 538.574.6

THE PROBLEM OF DIFFRACTION OF ELECTROMAGNETIC WAVES ON RIBBED CYLINDRICAL SURFACES

Gor'kiy IZV. VUZ: RADIOFIZIKA in Russian No 12, 1979 pp 1480-1484 manuscript received 13 Feb 79

CHUMACHENKO, V. P., Zaporog Machine-Building Institute

[Abstract] A method suggested earlier is used to analyze two-dimensional problems of diffraction of electromagnetic waves on cylindrical surfaces with cross sections consisting of broken lines. The form of the solution produced is independent of the shape of the surface, allowing a common algorithm to be constructed for analysis of the entire class of problems. A diagram illustrates the direction of scattering of the field upon diffraction of a plane wave from a cylinder with triangular and square cross sections. Figures 4; references 12 Russian.
[128-6508]

USSR UDC 551.510.535

HEATING OF THE IONOSPHERE WITH POWERFUL RADIO RADIATION WITH RANDOM MODULATION OF THE CARRIER FREQUENCY

Gor'kiy IZV. VUZ: RADIOFIZIKA in Russian No 12, 1979 pp 1534-1535 manuscript received 6 Mar 79

FROLOV, V. L., Scientific Research Institute of Radiophysics

[Abstract] The experimental results are presented of a study of the effect on the F layer of the ionosphere of a powerful radio beam with random modulation of the carrier frequency. The study is intended to determine the variation in the level of artificial turbulence excited as a function of degree of coherent of the pumping wave. The measurements performed showed that the time of coherent interaction of the high-power pumping wave with the ionospheric plasma is at least less than 10^{-3} s, i.e., less than the time of attenuation of plasma waves. Therefore it is assumed that the time of interaction of the radiation with the plasma waves is not determined by attenuation of the waves due to collisions, but rather by transfer of their energy away from the area of interaction. The author thanks L. M. Yerukhimov, N. A. Mityakov, V. O. Rapoport and S. M. Grach for discussion of the results obtained, as well as N. A. Zuykov and Yu. S. Golub for providing the operation of a powerful transmitter. References 5: 4 Russian, 1 Western.
[128-6508]

USSR UDC 621.319.7

NUMERICAL METHODS OF SOLUTION OF THE PROBLEM OF A CONDUCTING PLATE IN AN ELECTROSTATIC FIELD

Moscow IZV. VUZ: ELEKTROMEKHANIKA in Russian No 12, Dec 79 pp 1068-1075 manuscript received 3 Oct 77

STADNIK, IVAN PETROVICH, candidate in technical sciences, Dotsent, Simferpol' State University, and TELEGIN, ALEKSANDR PROKOF'YEVICH, graduate student, Simferpol' State University

[Abstract] A numerical method is suggested for solution of the problem of a conducting plate in an electrostatic field. The vector potential of a binary vector layer is derived. An electrostatic interpretation of the problem is presented and the charge density on the surface of the plate is calculated. Equations are presented for the voltage through the projection of a vector binary layer on the y axis for the plane-parallel case. Figures 5; references 4 Russian.
[121-6508]

USSR UDC 621.371.243

MULTIPLE SCATTERING IN LONG-RANGE TROPOSPHERIC PROPAGATION

Gor'kiy IZV. VUZ: RADIOFIZIKA in Russian No 12, 1979 pp 1421-1426 manuscript received 24 Apr 79

MOROZOV, V. YE., FREYLIKHER, V. D. and FUKS, I. M., Institute of Radiophysics and Electronics, Ukrainian Academy of Sciences

[Abstract] Multiple scattering can be considered during calculations of field intensities for electromagnetic waves propagating through media with random heterogeneities by solution of the radiant energy transfer equations. In calculation of the intensity of fields propagating through the actual troposphere, one must consider the influence of the surface of the earth. This article derives equations for field intensities which differ significantly from the classical equations but agree better with experimental data. Figures 1; references 6: 5 Russian, 1 Western.
[128-6508]

Instruments, Measuring Devices And Testers; Methods Measuring

USSR UDC 001.8:621.37/.39

PRESSING PROBLEMS OF THE THEORY OF SENSITIVITY OF ELECTRONIC AND ELECTROMECHANICAL DEVICES IN SYSTEMS

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 1, Jan 80 pp 8-10

ARMENSKIY, YE. V., ARUTYUNOV, P. A. and VOLKOV, N. P.

[Abstract] Modern day electronics deals with electrical, magnetic and electromagnetic phenomena throughout practically the entire range of electromagnetic oscillations from very low levels (10^{-14}-10^{-17} W) to very high levels (10^{6}-10^{9} W per pulse) of power. Today our ability to process information is determined primarily by the thermodynamic and quantum mechanical properties of the systems involved, which in turn are related to the energy of the processes occurring in the information systems. Several specific examples are presented of the use of methods of the theory of sensitivity, illustrating that further improvement of a number of physical properties by improvement of design and the technology of manufacture will soon be limited by the fluctuations and limitations resulting from the very basic laws of physics themselves. Examples illustrate a number of new and difficult problems which scientists must face in order to solve the measurement problems of today and the future. These problems include mathematical problems related to further improvement of the mathematical apparatus of systems theory, the theory of circuits and the theory of specific devices; physical and chemical problems, related to the study of new physical phenomena, supersensitive to useful signals and relatively insensitive to mechanical, thermal, optical, electrical, magnetic, chemical and radiation noise; and engineering problems in the area of sensitivity to products, ranging from the design stages through the stage of production and operation of devices to achieve the greatest possible sensitivity to useful signals and the least possible sensitivity to various types of noise. Figures 1; references 27 Russian. [135-6508]

USSR UDC 389.14:620.17/19:006.065

METROLOGIC SUPPORT OF TESTING OF ELECTRONIC PRODUCTS WHEN EXPOSED TO MECHANICAL AND CLIMATIC ACTIONS

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 1, Jan 80 pp 63-65

YAKUSHENKO, YE. A. and LYSOV, V. B.

[Abstract] At present, all work on the provision of unity in testing of electronic products when exposed to external factors is developing in two main directions: 1) Creation of standardized methods of testing and analysis of test results; and 2) Assurance of unity of reproduction and maintenance of test modes in accordance with the planned test methods. The basis of creation and development of the system of metrologic support for testing of products has been the basic standards, state testing systems and standards for methods of testing. The applicable state standards are briefly described and analyzed. A new branch of standard has now been developed, regulating methods of attestation and checking of vibration, heat and cold and other environmental effect test stands. State supervision and departmental checking are using to ensure maintenance of standards in testing. The experience of operation under the standards described has shown that metrologic support of testing should be based on a unified approach to metrologic attestation and certification of various types of testing equipment, agreement upon parameters studied, methods of testing of the parameters, close cooperation between metrologic services and organizations involved in developing testing equipment and methods. Problems of metrologic support should be solved in all stages of development, production and operation of testing equipment and methods.
[135-6508]

USSR UDC 389.14:621.317.33.089.68

NEW APPARATUS FOR TRANSMISSION OF THE DIMENSIONS OF UNITS OF ELECTRICAL CAPACITANCE AND INDUCTANCE

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 1, Jan 80 pp 50-53

GUSHCHINA, T. M., KUROCHKIN, F. YE. and POTEKHIN, D. P.

[Abstract] Unity is achieved in measurement of electrical capacitance and inductance by a system of standards and the use of standardized methods of storage and transmission of the dimensions of units throughout the nation. In the new system of standards for electric quantities, the unit of electric capacitance has become the basic unit, making the transmission of the

farad particularly significant. Two new types of capacitors with gas dielectrics have been created for this purpose. One with a cylindrical electrode and a capacitance of 100 pF, and one with a plate electrode and a capacitance of 100 pF. The characteristics of these devices and equivalent electrical circuits are presented. A new method has been developed for transmission of the Henry, based on calibration of standards with additive properties upon successive connection. A new design of a toroidal-coaxial coil has been developed to meet this challenge. Characteristics are outlined. Figures 3; tables 2; references 6 Russian.
[135-6508]

USSR UDC 535.854:543.42

APPLICATION OF THE THEORY OF QUASI-LINEAR FILTRATION TO THE PROBLEM OF PROCESSING OF THE SIGNALS OF HETERODYNE INTERFEROMETERS

Leningrad IZV. VUZ: PRIBOROSTROYENIYE in Russian No 10, Oct 79 pp 70-75 manuscript received 6 Sep 78

KORYABIN, A. V. and SHAML'GAUZEN, V. I., Moscow State University imeni M. V. Lomonosov

[Abstract] The structure of a system realizing the minimum mean square error of signal processing in heterodyne interferometers is determined using the theory of optimal nonlinear filtration. The system synthesized yields a time-averaged estimated represented by the phase of a tunable oscillators. Application of the theory of quasi-linear filtration to the task of processing the signals of a heterodyne interferometer shows that when the shot noise is unstable, the optimal system is a phase AFC device. Such a system allows investigation of small high-frequency vibrations of an object simultaneously with slower, larger-scale movements. The paper was recommended by the Department (Kafedra) of Basic Physics. Figures 2; references 9: 8 Russian, 1 Western.
[134-6508]

USSR UDC 621.3.011.4

ESTIMATE OF THE CAPACITANCE OF A HOLLOW SPHERICAL SEGMENT CONSIDERING HETEROGENEITIES OF THE DIELECTRIC

Moscow IZV. VUZ: ELEKTROMEKHANIKA in Russian No 12, Dec 79 pp 1083-1087
manuscript received 9 Dec 77; after completion 12 Apr 78

IOSSEL', YURIY YAKOVLEVICH, dr in technical sciences, Professor, Leningrad Shipbuilding engineer, central Scientific-Research Institute (TsNII) "Gipropri bor" [State Institute for Planning of Instrument Building Plants] (Leningrad)

[Abstract] A study is made of an elongated conductor in the form of a hollow spherical segment filled with a medium with a dielectric permeability different from that of the surrounding medium. Precise calculation of the capacitance of the conductor is quite difficult. Therefore, an attempt is made to calculate the limits within which the capictance lies for any ratio of dielectric permeabilities of inside and outside media. The results of numerical calculations are presented both as equations and in tabular form and allow quantitative estimation of the capacitance of conductors of this type. Figures 4; tables 1; references 5 Russian.
[121-6508]

USSR UDC 621.317

ESTIMATION OF ACCURACY OF MEASUREMENT OF INTEGRAL CHARACTERISTICS OF VARIABLE SIGNALS ON THE BASIS OF STOCHASTIC DISCRETIZATION

Leningrad IZV. VUZ: PRIBOROSTROYENIYE in Russian No 10, Oct 79 pp 3-7
manuscript received 20 Mar 79

SULTANOV, B. V. and YURMANOV, V. A., Penzen' Polytechnical Institute

[Abstract] An analysis is presented of the problem of the accuracy of the construction of variable signal integral characteristic measuring devices by processing of information on stochastically discretized instantaneous values of the signal being studied. The results of calculations performed using the equations derived in the article agree with results produced by simulation of the measurement method on a digital computer. The accuracy is greater than can be achieved with the Monte Carlo method unless very large samples are used. The paper was recommended by the Department (Kafedra) of Information-Measuring Techniques. References 5 Russian.
[134-6508]

USSR UDC 621.317.332.3

CONTACTLESS TESTING OF THE RUNNING RESISTANCE OF AN ISOLATED CONDUCTOR DURING CASTING

Leningrad IZV. VUZ: PRIBOROSTROYENIYE in Russian No 10, Oct 79 pp 18-23
manuscript received 2 Feb 79

DIMITRAKI, S. N., Kishinev Polytechnical Institute

[Abstract] Continuous and precise measurement of the resistance of fine-section wire as it is cast, with simultaneous use of the measurement channel for manual or automatic regulation and stabilization of the manufacturing process, is the only method known to reduce the variation in resistance over the length of the wire to an acceptable quantity. A number of methods are currently known for measurement of the running resistance of isolated conductors without damaging the insulation, but the error of these methods is too high. A compensation contactless method of continuous testing of wire is analyzed in which the coupling between the conductor and the measurement circuit is galvanic-resistive-capacitive. The advantages of the method are described and possible circuits for instruments using the method are diagrammed. The method is simple, has not over 0.5 percent error and is recommended for use in the manufacture of wire. Its main disadvantage is that it requires direct contact with the melted metal from which the wire is being formed. The paper was recommended by the Department (Kafedra) of Automatics and Computing Techniques. Figures 3; tables 1; references 6 Russian.
[134-6508]

USSR UDC 621.371.39.08:681.3.004.14

STUDY OF PARAMETRIC SENSITIVITY OF ELECTRONIC MEASUREMENT APPARATUS USING COMPUTERS

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 1, Jan 80 pp 11-14

KOFANOV, YU. N.

[Abstract] In planning measurement apparatus using computers, the sensitivity functions are of particular significance. For example, identification of machine models of parts of measurement apparatus considering parasitic design parameters is frequently performed by gradient methods, which require that the sensitivity function be found for all variable parameters. The best and most complete solution of the problem of planning of complex measurement apparatus is possible only when computers are applied in the

design process. The sensitivity functions of measurement apparatus can be determined using computers by applying machine methods in order to study the parametric sensitivity which have been developed for electronic devices of various kinds. Equations are presented which, when programmed for computers, can generate an analytic model of the sensitivity of a measurement apparatus. References 7: 6 Russian, 1 Western.
[135-6508]

USSR UDC 621.822.6.001.24:62-192

INCREASING THE ACCURACY OF SCANNING SYSTEMS IN THE MECHANISMS OF ELECTRONIC APPARATUS

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 1, Jan 80 pp 16-17

SOKOLOV, A. I., NEKRASOV, M. I. and GAN, K. G.

[Abstract] The drive mechanisms of electronic apparatus such as radar sets, radio astronomy and radio communications systems include devices which must aim the antennas. For small rocking angles, elastic suspension elements are frequently used. However, the most promising and universal type of bearing is the precision radial-thrust ball bearing which significantly reduces friction and increases the quality of operation of mechanical scanning systems. Examples of their use are given, including scanning devices on satellites which observe the radiation flux from the surface of the earth in a raster pattern. The authors studied the operation of high quality bearings in a vacuum in order to determine their suitability for this sort of use. The leading processes of damage to bearings of this type in a vacuum are listed. Bearings are less durable in a vacuum, because of seizure phenomena, rather than fretting corrosion and abrasive wear as in air. Methods are suggested for increasing the accuracy and durability of bearings in a vacuum, including reduction of contact forces, use of bearings with the largest possible number of balls, use of vacuum lubricants with high adhesion to the bearing steels and use of an outer moving ring whenever possible. References 3; 2 Russian, 1 Western.
[135-6508]

USSR UDC 538.56:519.25

SPECTRAL ANALYSIS OF RANDOM PROCESSES USING ACOUSTICOOPTICAL DEVICES

Gor'kiy IZV. VUZ: RADIOFIZIKA in Russian No 12, 1979 pp 1537-1538 manuscript received 26 Mar 79

PUGOVKIN, A. V., Tomsk Institute of Automated Control Systems and Radioelectronics

[Abstract] A single-channel acousticooptical spectral analyzer is studied, the input of which receives a random process. The output of an inertia-free square photodetector carries a signal proportional to the spatial spectrum of power, which is an estimate of the energy spectrum. Instantaneous spectral analysis of random processes using a single-channel acousticooptical spectral analyzer is analogous to the classical method of spectral analysis based on a Fourier transform of a "truncated realization." A diagram of a two-channel acousticooptical spectral analyzer using a laser and lens system is presented. Figures 1; references 3 Russian.
[128-6508]

USSR UDC 530.1:519.2

A MATHEMATICAL DESCRIPTION OF FLICKER FLUCTUATIONS IN FREQUENCY USING MODIFIED STRUCTURE FUNCTIONS

Gor'kiy IZV. VUZ: RADIOFIZIKA in Russian No 12, 1979 pp 1535-1537 manuscript received 18 May 78; after revision 10 Jul 79

PASHEV, G. P.

[Abstract] The most convenient description of the fluctuations in frequency of the signals of quartz and quantum-mechanical oscillators is the structure function, which can be used to perform spectral-correlation analysis of the fluctuations in frequency of oscillating systems and linear quadrupoles during flicker effects. Study and optimization of modern frequency-time devices and systems requires solution of the problem of linear extrapolation and interpolation of sequences of discrete readings of the process. This task can be conveniently performed by using a modified structure function. This function produces the most complete description of flicker fluctuations of frequency, combining the advantages of structure functions with simplicity of measurement and the ability to solve the problem of spectral-correlation analysis of modern frequency-time devices and systems. The author thanks A. N. Malakhov for helpful remarks. References 4 Russian.
[128-6508]

USSR UDC 538.61

MAGNETOOPTICAL DIFFRACTION OF LIGHT IN THICK LAYERS WITH REGULAR DOMAIN STRUCTURE

Gor'kiy IZV. VUZ: RADIOFIZIKA in Russian No 12, 1979 pp 1437-1452 manuscript received 28 Nov 78

MOROZOV, A. M. and SEMENTSOV, D. I., North Ossetian State University

[Abstract] The method of coupled waves is used to analyze the specifics of magnetooptical diffraction in thick layers with banded domain structure. The nature of the diffraction spectrum is determined and studied for various distributions of magnetism in the domains. It is shown to depend significantly on three parameters--layer thickness, the period of the banded domain structure and the wave length. Figures 4; tables 1; references 13: 10 Russian, 3 Western.
[128-6508]

USSR UDC 621.315.592

DYNAMICS OF RESOLUTION OF A GUNN DOMAIN AT A VOLTAGE BELOW THE DISAPPEARANCE THRESHOLD

Leningrad FIZIKA I TEKHNIKA POLUPROVODNIKOV in Russian No 12, Dec 79 pp 2332-2337 manuscript received 24 Apr 79

LEVINSHTEYN, M. YE. and SIMIN, G. S., Institute of Physics and Technology imeni A. F. Ioffe, USSR Academy of Sciences, Leningrad

[Abstract] The process of resolution of a Gunn domain is studied over a rather wide range of parameters of the specimen by computer modeling. The way in which domains are resolved when voltage across the specimen is below the minimum voltage necessary to maintain the domain is analyzed. The diode as described by ordinary field model equations with field-independent diffusion. All of the basic regularities of the process of resolution of a domain are described by the Kurokawa equation. The authors thank M. I. D'yakonov for helpful council and discussion. Figures 4; references 13: 7 Russian, 6 Western.
[131-6508]

USSR UDC 621.315.592

THE EDGE OF ABSORPTION OF GERMANIUM IRRADIATED WITH FAST NEUTRONS

Leningrad FIZIKA I TEKHNIKA POLUPROVODNIKOV in Russian No 12, Dec 79 pp 2378-2383 manuscript received 15 Jun 79

ALANIYA, N. M., GERASIMOV, A. B., NARSIYA, G. SH. and ERISTAVI, G. L.

[Abstract] A study is made of the light transmission spectrum of germanium in the 0.84-0.6 eV energy area. Specimens of both n and p type were irradiated with 3 doses of fast neutrons: $2\cdot10^{16}$, $2\cdot10^{17}$ and $2\cdot10^{18}$ cm^{-2} at temperatures of not over 80°C. Both of the two higher radiation doses caused similar changes in the spectra of the specimens. All of the specimens studied were contained in the same capsule when irradiated in the reactor channel. Therefore, differences in the absorption edge spectrum observed in the irradiated specimens must be determined by the concentrations and types of impurities present. Isochronic annealing of irradiated specimens restored the radiation edge spectra to that of non-irradiated specimens. Figures 3; references 9: 5 Russian, 4 Western.

[131-6508]

USSR UDC 621.315.592

CHARGE TRANSFER IN p^+-ν-n^+ STRUCTURES FOLLOWING "FREEZING" OF IMPURITIES

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YEREMIN, V. K., STROKAN, N. B., ZAVERYUKHIN, B. N., MUMINOV, R. A. and SHAMAGDIYEV, A. SH., Institute of Physics and Technology imeni A. F. Ioffe, USSR Academy of Sciences, Leningrad

[Abstract] An earlier work showed that with incomplete coupling of a p^+-ν-n^+ structure, the remaining electroneutral area of the base contributes an additional exponential signal component which is determined by the conductivity of the base. In this work, this factor is used to study heterogeneities in materials. It is shown that by regulating the conductivity of the base by "freezing" of free carriers, one can determine the scale and geometry of heterogeneous sections. Structures of highly pure germanium with a concentration of electrons in the new area of $2.5\cdot10^{10}$ and $5\cdot10^{9}$ cm^{-3} were used, specimen thickness 2 and 6 mm. The authors express deep thanks to S. M. Ryvkin for discussions and N. I. Tisnek for consideration of the results of the work as well as M. I. Ginzburg and Ye. Ye. Khaller for the presentation of ultra-pure specimens of germanium. Figures 3; references 5: 4 Russian, 1 Western.

[131-6508]

USSR UDC 621.382.2

MODES OF MICROWAVE GENERATION IN GUNN DIODES AT A FREQUENCY ABOVE THE TRANSIT FREQUENCY

Leningrad FIZIKA I TEKHNIKA POLUPROVODNIKOV in Russian No 12, Dec 79 pp 2316-2322 manuscript received 13 Apr 79

ALTUKHOV, I. V., KAGAN, M. S., KALASHNIKOV, S. G., KUKUSHKIN, V. V. and SOLYAKOV, V. N., Institute of Radiotechnology and Electronics, USSR Academy of Sciences, Moscow

[Abstract] In an earlier work, the authors showed that specimens of GaAs placed in a resonator with a frequency significantly higher than the transit frequency may oscillate at the transit frequency due to the periodic movement of domains as well as at a second frequency, equal to the resonant frequency of the resonator, resulting from excitation of HF oscillation by the back impedance of the specimen with the moving domains. Two-frequency oscillation occurred under conditions such that there should be limited space charge accumulation and uniform distribution of the field in the specimen. This article studies the conditions of existence of the single and double frequency mode. It is shown that the criterion of existence of the limited space charge accumulation mode is more rigid than previously thought. Experimental data are also presented on the areas of existence of these modes and the peculiarities of the transition between them. Uniform field distribution in the limited space charge accumulation mode is shown to be stable only over a limited range of bias and amplitude of HF voltages. The authors thank Ye. G. Lansberg for discussions. Figures 5; references 8: 4 Russian, 4 Western.
[131-6508]

USSR UDC 621.382.2

STUDY OF THE KINETICS OF CHARGE CARRIERS IN THERMOELECTRICALLY ANISOTROPIC SEMICONDUCTORS IN THE AREA OF NATURAL CONDUCTIVITY

Leningrad FIZIKA I TEKHNIKA POLUPROVODNIKOV in Russian No 12, Dec 79 pp 2399-2401 manuscript received 27 Apr 79

DAKHOVSKIY, I. V., OSIPOV, E. V. and POTYKEVICH, I. V., Kiev Higher Military Engineering School of Communications imeni M. I. Kalinin

[Abstract] The relaxation time and effective mass of intrinsic charge carriers are studied on the basis of the theory of anisotropic scattering and experimental data on the variation of conductivity and thermal emf of pure single crystals as a function of temperature. The method is illustrated with experimental data on the temperature variation of conductivity and

thermal emf of single crystals of a solid solution of $Zn_{0.1}Cd_{0.9}Sb$. The method presented in the work allows theoretical estimation of the contribution of other scattering mechanisms, such as scattering on ionic impurities, and other effects, such as galvanomagnetic and thermal magnetic effects. Figures 1; references 3 Russian.
[131-6508]

USSR UDC 621.382.3

STUDY OF THE SPECTRAL CHARACTERISTICS OF ELECTROLUMINESCENT RADIATION FROM SILICON DEVICES

Leningrad FIZIKA I TEKHNIKA POLUPROVODNIKOV in Russian No 12, Dec 79 pp 2308-2311 manuscript received 28 Aug 78; in final form 17 Mar 79

KIREYEV, P. S. [Deceased] and GUSAROVA, S. N.

[Abstract] A study is made of the spectral characteristics of radiation in silicon devices as a function of the temperature and operating mode of the devices. Powerful mesa-planar transistors with an n-p-n structure were studied. The junctions were produced by diffusion of phosphorus and boron in silicon. Radiation was recorded on the emitter side. Current pulses with modulation frequencies of 300 Hz were fed to the transistors. The spectral characteristics of the collector junction at 77 K are illustrated, and the change in spectral characteristics of the junction is found to agree well with the theoretical curve of the rate of radiative recombination, considering emission of a TO phonon. Figures 1; references 9: 3 Russian, 6 Western.
[131-6508]

USSR UDC 621.382.3

STUDY OF MULTILAYER THIN-FILM BISMUTH-TELLURIUM STRUCTURES

Leningrad FIZIKA I TEKHNIKA POLUPROVODNIKOV in Russian No 12, Dec 79 pp 2323-2326 manuscript received 15 Dec 78; in final form 16 Apr 79

UKHLINOV, G. A., GARANIN, V. P. and VIGDOROVICH, V. N., Moscow Institute of Electronic Technology

[Abstract] A study is made of multilayer bismuth-tellurium, because the effects of contact alloying and contact modification of the surface are significant in different thickness intervals. A study of the variation in resistivity and thermal emf of the multilayer specimen shows two characteristic features: saturation of the dimensional variation of resistivity and an increase in thermal emf to a maximum at a bismuth layer thickness of about 3,000 Å with tellurium interlayer thickness about 200 Å. The experimental data agree well with calculations based on the theory of dimensional effects for resistivity and thermal emf assuming mirror scattering of electrons and diffuse scattering of holes on the surface. Figures 3; references 17: 13 Russian, 4 Western.
[131-6508]

USSR UDC 533.951

PLASMA WAVES IN A MOVING, WEAKLY UNSTEADY PLASMA

Gor'kiy IZV. VUZ: RADIOFIZIKA in Russian No 12, 1979 pp 1417-1420 manuscript received 27 Feb 79

PIKULIN, V. D., Gor'kiy State University

[Abstract] Using the apparatus of the well-known approximation of 4-dimensional geometric optics, the peculiarities of propagation of plasma waves are studied in a slightly heterogeneous medium in which the parameters change with time as a result of variations in drift velocity. The linearized kinetic equation is studied in order to determine the perturbation of the distribution function under the influence of the weak high-frequency field of the wave, ignoring the contribution of ions and collisions. Equations are presented for the dielectric permeability tensor, local dispersion, refraction of rays and variation in frequency along group trajectories. The author thanks N. S. Stepanov for constant attention to and consideration of the work. References 8: 5 Russian, 3 Western.
[128-6508]

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